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EDITORIAL COMMENTARY

CPAP Failure in Neonates: Practice, Experience, and Focus Do Matter!

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Continuous positive airway pressure (CPAP) is a simple, non-invasive, and cost-effective therapy, particularly for preterm neonates with respiratory distress syndrome (RDS). It decreases the need for mechanical ventilation as well as the risks of mortality and bronchopulmonary dysplasia (BPD). However, 20–40% of neonates initiated on CPAP might fail and require intubation and mechanical ventilation [1]. The consequences of such CPAP failure are severe, including a significantly higher risk of mortality, intraventricular hemorrhage, and BPD [2]. Early identification of neonates who are at-risk of CPAP failure allows for selective use of mechanical ventilation, thereby reducing the risk of complications.

In this issue of the Journal, Murki and colleagues [3] have published a retrospective study on the predictors of early CPAP failure among 652 preterm neonates with respiratory distress admitted in their center over the last decade or so. Of these, 14.7% had early CPAP failure, defined as the need for mechanical ventilation within 72 h of birth. Adjusting for the gestation and year of study, the authors identified the delay in initiation of CPAP, need for surfactant therapy, delay in surfactant administration, and higher initial fractional inspired oxygen (FiO_2) concentration as the significant predictors of CPAP failure. Not surprisingly, the risk of neonatal morbidities and the duration of hospital stay were higher in neonates who failed CPAP.

The predictors of CPAP failure observed are not very different from those reported by earlier studies [2, 4, 5]. Broadly, the predictors reported in the literature can be grouped into (1) baseline characteristics like gestation, birth weight, and need for resuscitation at birth; (2) severity of respiratory distress, including high respiratory distress scores, chest radiographic findings, FiO_2 requirement in the initial hours of life, need for surfactant, and blood gas parameters; and (3) management-related issues, including the delay in initiation of CPAP, delay in surfactant administration, and skills and experience of healthcare providers in providing CPAP [4, 6, 7]. However, none of these predictors or prediction scores can replace an astute clinician – physician or nurse – standing by the bedside and monitoring the neonate continuously to identify and rescue that occasional infant failing CPAP.

What then, are the practical implications of the findings of the present study? Given the reasonably large literature on the predictors of CPAP failure and the increasing experience of healthcare providers in CPAP administration in most level-3 NICUs, any new knowledge of predictors of failure is likely to have only incremental relevance in these settings. However, it is of great value in the Level-2 or special care newborn units (SCNUs) that have recently started the practice of CPAP in preterm neonates. It will help the healthcare providers of these units to identify the group of neonates who are likely to fail CPAP and, therefore, would need a referral to a higher center for surfactant administration or mechanical ventilation. From that perspective, the findings of the present study – from a Level-3 unit with impressively low CPAP failure rates (14% vs. 20–40% reported in other studies), and high cesarean deliveries and antenatal steroid coverage (both around 90%) – might have limited generalizability [1]. Further, four out of the five studies included in the present analysis were randomized controlled trials (RCT) with strict inclusion and exclusion criteria that might further affect the generalizability. However, the limited generalizability or external validity is, in general, not a significant concern; it is the internal validity that is of paramount importance.

The authors have used strict enrolment criteria, standard definitions, and uniform protocol for administration and weaning of CPAP to ensure adequate internal validity. Notwithstanding a few minor issues in the multivariable regression analysis such as (a) not specifying the method used to select the variables to be included in the model; (b) inclusion of correlated variables like receipt of surfactant *and* time of

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surfactant administration; and (c) estimating the odds of failure per unit change in age at initiation of CPAP *in hours* when the 75th centile in postnatal age at initiation was *50–60 min*, the results are valid and should guide healthcare providers from similar Level-3 NICUs to predict early CPAP failure. However, to extrapolate these results to the SNCUs, one should consider the additional barriers in offering CPAP in these units – inadequate infrastructure, lack of adequate equipment and consumables, shortage of skilled staff, and insufficient training [8]. These barriers need to be addressed, and regular training offered to nurses to improve the CPAP success rates in these settings. A study from Malawi showed that the early implementation of CPAP therapy led by nurses could decrease neonatal mortality [9]. Training of nurses and the use of a checklist for monitoring can reduce nasal injuries due to CPAP and optimize CPAP delivery [10].

The implications of the study, however, transcend that provided by the traditional study results. Indeed, the present study provides two critical messages for the clinicians and researchers alike: (1) *experience and training matter even in the high-technology era we live in* – the gradual decrease in CPAP failure rates, from 21.7% to 8.5%, over a decade in the unit underscores the need for periodic training and capacity building of the healthcare providers; and 2) *the unwavering focus of research in and around a single theme yields significant benefits* – to publish five studies (including four RCTs) on CPAP application over a decade is an extraordinary feat by the authors, which needs to be emulated by one and all.

Compliance with Ethical Standards

Conflict of Interest None.

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